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Changes to ASME B31.3, "Process Piping"

By Vince Carucci

The 2014 edition of ASME B31.3 is a revision of the 2012 edition, was officially issued February 27, 2015, and became effective six months after that date. As with previous editions, it includes several pages at the beginning that highlight where changes were made, and these are further identified by a margin note (14) in the body of the code placed next to the affected area.

This article highlights several, but not all, of the technical changes. Please refer to ASME B31.3 for complete details.

- Para. 300.2b. Definition of Category M fluid service revised to also require the owner to determine that the requirements for Normal Fluid Service do not provide sufficient assurance of leak tightness.
- Table 300.4. Entry for Appendix P, "Alternative Rules for Evaluating Stress Range" deleted to be consistent with deletion of this Appendix.
- Para. 302.3.5d. Added definition of S_L , stress due to sustained loads, which was inadvertently left out of the 2012 code although S_L was included in the equation for calculating the allowable displacement stress range. In doing so, the definition acknowledges that supports may be active in some conditions and inactive in others, and the maximum value of S_L considering all support conditions must be used.
- Table 304.1.1. Revised by adding two new temperature break points for determining coefficient Y in the required wall thickness equation: 1200°F, and 1250°F and above.
- Para. 305.2.3 that specifies pipe that may be used for severe cyclic conditions has been simplified by referring to pipe listed in Tables A-1A and A-1B, and specified quality factors, rather than listing the pipe specifications here.
- Para. 306.6 covering thermowells has been added.
- Para. 319.2.3b covering displacement stress range has been edited to recognize that supports may be active in some conditions and not in others, and this must be considered in the analysis. I have had to point out this active vs. inactive support situation to contractors many times while auditing their piping system analyses.

Work Highlights

FCCU

- Completed support to a refiner that involved regenerator flue gas system analysis and upgrade to increase reliability, process operating flexibility, and improve mechanical integrity.

Flexicoking

- Assisted a licensor in preparing generic Flexicoker operations training materials for their general use.

Mechanical

- Mechanical and materials engineering review was made of inspection data of a pipeline feeding crude oil to a refinery. The line had experienced significant internal and external corrosion in aboveground, underground, and submarine portions of the line. Various pipeline repair alternatives were provided, the most likely corrosion mechanisms were identified, and recommendations made for mitigation of the corrosion.

Process

- Assisted a domestic client with a technical readiness assessment (TRA) of their selected licensed sulfur recovery technology.

- Para. 319.5 covering reactions has been revised and expanded in several respects. For example, it recognizes that the potentially beneficial effect of cold spring in reducing reaction loads cannot be assured, and design calculations must consider this. Some companies have recognized this situation in their engineering standards for many years and limited the potential use of cold spring.
- Para. 328.5.4b and c have been revised and Para. 328.5.4i has been added to cover requirements for integrally reinforced branch connection fittings. There is also a new Fig. 328.5.4F that provides acceptable details for such fittings.
- Para. 328.7 is new and covers requirements for structural attachment welds.
- Para 330 and Table 330.1.1 covering preheat temperatures have been revised. For example: weld metal analysis "A-No" has been eliminated, carbon percent has been added as a criterion for carbon steels, at least some preheat temperatures have been changed, etc.
- Para. 331.1 and Table 331.1.1 covering heat treatment requirements have been revised. For example in the table: "A-No" was eliminated and Group Nos. are added, maximum Brinell hardness was deleted, etc.
- Table 331.1.2 was added and provides alternate PWHT requirements for carbon and low alloy steels, P-Nos. 1 and 3.
- Table 331.1.3 was added and covers possible exemptions to mandatory PWHT. This identifies additional requirements or limitations that must be used (e.g., higher preheat temperature, multiple layer welds, etc.).
- Para. 342.1 covering NDT personnel qualifications revised to require certification per ASME Code Section V. It previously referred to SNT-TC-1A for guidance.
- Paras. 344.3 and 344.4 covering magnetic particle and liquid penetrant examinations, respectively, completely revised and expanded to include methods and acceptance criteria.
- Para 345.2.1a covering limitations on test pressure. Revised to clarify that the pipe stress cannot exceed the material yield strength based on minimum pipe wall thickness. This recognizes that pipe may be supplied thinner than the nominal thickness up to its under thickness tolerance (typically 12 1/2 %).
- Para 345.2.2a regarding examination for leaks. Revised to permit a reduction in test pressure to not less than the design pressure while the examination is being done.
- Para. 345.4.2 covering hydrostatic test pressure has been revised. For example:
 - The maximum value of (S_T/S) is no longer limited to 6.5.
 - If the piping system is made up of equivalent lengths of more than one material, the minimum calculated value of (S_T/S) must be used.
- Para. 345.5.4b covering pneumatic test pressure has been revised to clarify that the pipe stress cannot exceed 90% of the material yield strength based on minimum pipe wall thickness.



- Numerous revisions have been made to the requirements for piping in Category M fluid service contained in Chapter VIII. Refer to ASME B31.3 for details. For example:
 - Para. M302.2.4 does not permit allowances for pressure and temperature variations.
 - Para. M306.4.2 now states that flared laps shall not be used. They were previously permitted if they met certain requirements.
 - Para. M320 has been added to require the analysis of sustained loads per Para. 320. Its prior omission was probably an inadvertent oversight.
 - Para. M321 has been revised to clarify that only supporting elements that are welded to the pipe must be of listed material. The prior wording required that all pipe supporting elements must be of listed material.
 - Para. M322.6.3 was revised to refer to the ASME Code Section VIII for overpressure protection requirements.
 - Para. M335.10 has been added to cover pipe identification requirements.
- Numerous other revisions were made in Chapter IX (High Pressure Piping), Chapter X (High Purity Piping), Appendix A (Allowable Stress and Quality Factors for Metallic Piping and Bolting Materials). Refer to ASME B31.3 for details.

About the Author

Vincent Carucci, President of Carmagen Engineering, Inc., also provides mechanical engineering expertise in the areas of pressure vessels, heat exchangers, piping systems, and storage tanks to the process and power industries, insurance companies, and attorneys. If you would like more information, please contact Vince at vcarucci@carmagen.com.

